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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/530,442	04/07/2005	Keiji Nishihara	067471-0070	4950

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EXAMINER	
RO, BENTSU	

ART UNIT	PAPER NUMBER
2837	

DATE MAILED: 12/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/530,442	NISHIHARA ET AL.	
	Examiner	Art Unit	
	Bentsu Ro	2837	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4/7/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

FIRST OFFICE ACTION

1. Drawing correction is required as follows:

Applicant should label Fig. 14 as "prior art".

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant acknowledged prior art Fig. 14 in view of Neidorff et al US Patent No. 5,929,577.

With respect to claim 1, applicant acknowledged prior art Fig. 14 teaches every element in the claim, including a plurality of transistors (the power supply 1020), a position detector (the position detector 1030), a power distributor (the distribution controller 1060), a switching controller (the switching controller 1050).

With respect to claim 1, the prior art Fig. 14 does not teach :

"wherein the switching controller further controls so as to force the plurality of transistors into the OFF state for a predetermined duration in a predetermined cycle, and

the position detector detects only while the switching controller forcedly keeps the plurality of transistors in the OFF state."

This limitation, according to applicant's disclosure in the specification page 4, lines 6-8, is to force PWM operation off during the time period of position detection.

This limitation, however, is taught by Neidorff et al. Neidorff et al Fig. 1 teaches a "PWM DISABLE CIRCUIT 84" (reference numeral "84" is missing in Fig. 1). This pwm disable circuit 84 is to force the plurality of transistors into the OFF state for a predetermined duration in a predetermined cycle so that the position detector can detect the rotor position during this forced OFF period. See Neidorff et al column 3, lines 31-40 and 50-52, for examples.

In view of Neidorff et al teaching, it would have been obvious to a skilled person in the art to add this feature to the prior art circuit Fig. 14 to achieve the same subject matter as claimed.

Then why adding such a disable circuit to the prior art Fig. 14 ???

It is recognized by Neidorff et al (and also by applicant) that the PWM may induce switching noise in the un-energized winding of the motor, see Neidorff column 1, lines 32-34 (requiring low pass filter and integration) and column 1, lines 52-53 (the noise susceptibility). Thus, during rotor position sensing period, the PWM operation adds noise to the sensed signal due to the PWM. Therefore, it is desirable to force OFF the PWM during the rotor position sensing period. See Neidorff column 1 last line to column 2, line 1 and column 3, lines 52-55.

With respect to claim 2, the force OFF of PWM requires any one of (1) all transistors OFF; or (2) upper group of the inverter transistors OFF; or (3) lower group of the inverter transistors OFF.

Claim 3 does not set forth any limitation because (1) the so-called "a predetermined period" is undefined and (2) the "a change from the ON state to the OFF state" is undefined (i.e. the ON state of what? and the OFF state of what?).

With respect to claim 4, the detecting rotation speed is taught by Neidorff. Neidorff Fig. 1 shows a frequency-to-voltage converter 77 to generate a motor speed feedback signal V_S. The so-called "a predetermined speed" is undefined and therefore is met by both the prior art Fig. 14 and by Neidorff et al.

Claims 5 and 6 are met by the prior art Fig. 14 and by Neidorff et al because the "predetermined speed" and the "predetermined duration" are undefined. Applicant should note that the "predetermined speed" (or duration) could be any speed, what-so-ever.

With respect to claim 7, Neidorff et al Fig. 1 showing the speed signal is derived from the zero-crossing signal Z-XA. The zero-crossing signal is a rotor position detection signal.

With respect to claim 8, the high frequency operation reads onto PWM of Neidorff et al.

With respect to claim 9, the force OFF period is about one cycle of the PWM carrier frequency as shown in Neidorff's Fig. 5. The carrier frequency, in most PWM applications, is set at 20 KHz. Thus, the force OFF period is about 50 us (microsecond), which is 1/20,000 second. Why the carrier frequency is set at 20 KHz ? The 20 KHz is the upper-limit of human being hearing frequency, beyond that, the human being cannot hear. Therefore, setting 20 KHz as carrier frequency avoid the

annoyance to human being. Then why not set a frequency higher than 20 KHz ? Yes, one can set a higher carrier frequency. However, a higher carrier frequency increases the transistor's switching loss. Thus, the 20 KHz carrier frequency appears to be the optimized frequency.

With respect to claim 10, Neidorff Fig. 1 teaches a center tap 26 and a winding 14 for sensing the back EMF voltage. Neidorff column 3, lines 45-46 states *"sensing the back EMF across at least one of the windings experiences a zero crossing..."*. Neidorff's "at least one" implies that more than one windings can be used for rotor position sensing.

With respect to claim 11, when transistors is OFF, the current obviously decays to zero. Further, Neidorff's position sensing is based on "zero-crossing".

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-11 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Neidorff et al.

Claim 1 reads onto Neidorff et al teaching as follows:

Claim 1 (Currently amended):	Neidorff et al teaching:
A motor driver that drives a motor composed of plural-phase windings that generate a magnetic field for rotating the rotor, comprising:	Fig. 1 shows a brushless dc motor 10 having three phase windings 14, 16, 18; the windings 14, 16, 18 generate a magnetic field for rotating a rotor (not

	shown);
a plurality of transistors that operate as switches for supplying current to the windings;	Fig. 1 shows transistors 34, 36, 38, 40, 42, 44;
a position detector operable to detect a rotational position of the rotor, based on a terminal voltage of each winding;	Fig. 1 shows a sample & hold circuit 68, a zero-crossing comparator 72, and the associated circuit elements for detecting a rotor position based on the terminal voltage of winding 14; Neidorff et al do not show "detecting terminal voltage of each winding" but show "detecting terminal voltage of winding 14 only"; however, detecting the terminal voltage of each winding is obvious for at least the following three reasons: (1) Neidorff column 3, lines 45-46 states that "at least one winding" can be used to detect the back EMF; thus, Neidorff does not limit to the single winding 14, it can be the winding 16 and/or the winding 18; (2) using windings 14, 16, 18 together for back EMF detection may be required if a very high accuracy of rotor position signal is required; (3) most prior arts teach sensing back EMF for rotor position determination based on the un-energized of motor windings; for a three-phase motor, the un-energized winding is one; and this "one" can be any one of the three windings 14, 16, 18; it is noted that to include windings 16 and 18 does not require any complicated circuitry, the only requirement is a multiplex switch for selectively switching the un-energized winding for rotor position detection;

a power distributor operable to control power distribution to the plural phase windings by means of the position detector; and	Fig. 1 shows inverter switches 34-44;
a switching controller operable to have performed a high-frequency switching method to turn the transistors to an ON state or OFF state for controlling the rotor at the predetermined speed by means of the position detector,	Fig. 1 shows a decoder & drive signal generator 80 for controlling the ON and OFF state of the inverter transistors 34-44; Fig. 1 further shows a ramp generator 81 and a PWM comparator 82 for generate a PWM signal to the controller 80 for controlling the ON/OFF state of the inverter transistors 34-44 at a high frequency, see Figs. 4, 5, 8 for high switching frequency; in the text, Neidorff et al repeatedly state "a constant speed motor", see column 5, line 11, for example; the constant speed is controlled by PWM and by the rotor position signal, see Fig. 1, the input signals to the generator 80; the input signals include position signals POS A, POS B, POS C, zero crossing signal Z-X, and PWM gating signal GATED\PWM;
wherein .... (to the end of claim 1).	same as explained previously in paragraph 3 above; applicant should read the complete text teaching of Neidorff et al.

The reason of rejection for claims 2-11 is same as that explained previously in paragraph 3 above. Repetition is un-necessary.

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

7. Any inquiry concerning this communication should be directed to Bentsu Ro at telephone number 571 272-2072.

Bentsu Ro

12/1/2005

Bentsu Ro
Senior Examiner
Art Unit 2837